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Bifurcations and new uniqueness criteria for critical points of hyperbolic derivatives

Kazantsev A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Types of bifurcations of zeros for the gradient of a hyperbolic derivative of a holomorphic function on the unit disk are determined, provided that the derivative is embedded in the family of level lines of the given function. The character of the dependence of the motion of zeros on the curvature of the hyperbolic derivative is described, which makes it possible to extend the Poincaré-Hopf theorem so as to obtain a class of new uniqueness conditions for zeros in the form of nonnegativity conditions on curvature-type functionals. This class contains a one-parameter series of Epstein inequalities obtained from the Behnke-Peschl linear convexity condition for Hartogs domains of special form. A specific rigidity effect arises; namely, the inequalities mentioned above are meaningful only on a finite interval of parameters. © 2011 Pleiades Publishing, Ltd.

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Keywords

Behnke-Peschl linear convexity, bifurcations of critical points, conformal radius, hyperbolic derivative, linear invariance